FURTHER IMPROVEMENTS IN AND RELATING TO FENCING

TECHNICAL FIELD

The present invention is directed to the construction of fences. Preferred embodiments comprise fences of metal construction of the type having an upright element spanning two or more rails.

BACKGROUND ART

While in the past many fences have been constructed of masonry or wood, the use of metal for fence construction is becoming more widespread. Typically, such construction comprises lengths of metal tubing which are arranged in an upright fashion between horizontal rails. The method of construction may vary and in some cases the horizontal rails may merely be end capping pieces for the upright elements. In other instances, each rail may pass entirely through the rail and be welded into place. In other arrangements, the upright elements may be fixed to the outside of the rail.

A problem with the prior art is that such methods of construction can sometimes be time consuming, especially where spot welding systems are relied upon to maintain the upright elements in place. Another problem with the prior art is that it is often difficult to use the known methods of construction on uneven ground. Where upright elements pass through, or enter, rails the tolerances are usually quite tight and the upright elements are exactly perpendicular to the rails. When constructing such a fence, the rails must always be truly horizontal, otherwise the upright elements will be non-vertical, and particularly displeasing to the eye.

When such a fence is to be constructed for on sloping ground, each section of fence must be stepped. If not, one ends up with the particularly displeasing situation of rails parallel to the ground, which in itself is aesthetically pleasing, but where the uprights are perpendicular to the ground and non-vertical – very displeasing.

The stepped arrangement causes further problems as the lower rail may be almost touching the ground at the end of one section, and have a considerable gap underneath at the other end of that section. This generally necessitates building up a foundation to close this gap, or altering the contour of the ground. For greater slopes, very short stepped sections may be required, which also increases the number of posts which must be secured into the ground. These factors can greatly add to the time and expense of constructing a fence.

It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

DISCLOSURE OF INVENTION

According to one aspect of the present invention there is provided a fence, or preassembled fence section, comprising a plurality of upright elements spanning at least two rails, the arrangement being such that the upright elements are positioned within apertures in said rails, and there being inserts interacting between a said rail and an upright member to maintain the relative disposition of same.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which there are at least two types of insert used for interacting between a rail and upright member.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which a said insert is positioned within the apertures in a rail and lock in place with respect to same so as to resist easy withdrawal in a direction substantially parallel to the longitudinal axis of an inserted portion of an upright element.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which said insert interlocks with and is retained by the rail by at least one of the following methods:

- there is one or more retractable, compressible, or deformable arms or barbs which, once the insert is positioned, splay outwardly and resist withdrawal of the insert;
- a keyed relationship between insert and rail, and
- at least part of the insert being compressible and/or deformable and including a locating groove or recess for accommodating part of said rail.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which an insert interlocks with and is retained by the rail by a clipping arrangement involving a separate retaining member interacting with either or both the insert and rail.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which a said insert presents, to the upright element, a sleeve or collar portion whose internal diameter and shape is commensurate to the external diameter and shape of the inserted portion of said upright element.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which there is an interlocking relationship between an insert and its associated upright element.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which said interlocking relationship between a rail and its associated upright member comprises a method in which:

- there is one or more retractable, compressible, or deformable arms or barbs provided on the upright member which, once the upright element is positioned, splay outwardly and resist withdrawal of the insert;

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which said interlocking relationship between a rail and its associated upright member comprises at least one of the following methods:

- a portion of the upright member including a locating groove or recess for accommodating a feature on said insert, and
- a portion of the insert including a locating groove or recess for accommodating a feature on said insert.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which at least a portion of said insert is deformable or compressible in order to allow the feature, and groove or recess, to engage during assembly.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which said interlocking relationship between a rail and its associated upright comprises a keyed relationship between the upright member and the insert with which it is associated.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which an insert allows an inserted upright element to be oriented at least a small angle from the perpendicular to the rail.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which the small angle is $\pm 30^{\circ}$ from the perpendicular.

According to another aspect of the present invention there is provided fence, or preassembled fence section, substantially as described above in which said rails are attached, or adapted to interact with, substantially upright posts or anchor points for support.

According to another aspect of the present invention there is provided a fence, or preassembled fence section, substantially as described above in which either or both a rail or upright element comprises metal construction.

According to a further aspect of the present invention there is provided a fence, or preassembled fence section, comprising a plurality of upright aluminium or steel elements, said elements being connected to substantially perpendicular steel or aluminium rails by means of inserts which are at least partially formed of a plastics material, the rails being secured to posts or other suitable anchor points.

According to a further aspect of the present invention there is provided a kitset comprising inserts, rails, and upright members, for the construction of a fence, or fence section, according to any one of the preceding claims.

According to a further aspect of the present invention there is provided a method of fence construction comprising the provision of rails of apertures of a size and configuration to accept an insert, securing said rails to posts or anchor points, and including the substantially perpendicular and/or upright placement of upright elements in the apertures of said rails such that an insert is intermediary a rail and upright element, and ensuring the upright elements are resistant to ready withdrawal from said rails.

It is envisaged that the present invention will be used primarily for construction of fences of metal, though other materials could also be used. For simplicity, however, the present description shall be directed to metal fences constructed of steel or aluminium, aluminium alloys, and various iron alloys.

The present invention focuses on fence construction which comprises two (or more) substantially horizontal or ground following rails which are spanned by a plurality of upright elements. According to the present invention the rails may be oriented to be truly horizontal, though may also be fastened so as to parallel the lie of the land.

The upright elements will generally always be substantially vertical, though it is possible that a user may wish to vary from the true vertical for effect. Accordingly, the term upright when applied to 'upright element' may be interpreted fairly loosely, and typically signifies that the element will typically attain a reasonably upright position when spanning rails – depending on user choice. Typically this will also mean that the upright elements are substantially perpendicular to the rails but again this may vary – see also later herein.

A potentially realisable advantage of the present invention is that the fence may be assembled on site. In contrast, most prior art systems rely on factory assembled sections which are merely fastened to a post or other anchor point. There is little flexibility in this system and care must be taken to ensure that the fence posts are positioned accurately. However this does not preclude this method of installation from the scope of the present invention – this is primarily a matter of choice for the installer.

Further, there are often limitations in the size of fence sections so that a user must conform with what is predetermined at the factory. On level ground, this may not represent a problem, though on sloping ground, shorter sections may be required. It may therefore be necessary for a user to request fence sections of customised size, which can increase the cost to the user. With the present invention, it is envisaged that customisable pre-assembled sections may potentially be easier and quicker to construct.

In contrast, the present invention is readily adapted to be assembled on site. The ability to angle the upright elements in many embodiments from being truly perpendicular to the rails, alleviates some of the problems of irregular section lengths encountered with

sloping ground. Where customised section lengths (between posts) are required, the provided rails may merely be trimmed on site to the required size. Depending upon how the rails are fastened to the posts or anchor points, this impromptu trimming will not cause a problem in many instances.

At least part of the advantages which can be realised through use of the present invention stem from the manner by which the upright elements and rails connect. In prior art systems, which require welding or press fitting of the different elements, it is not normally practical nor possible to construct the fence sections on site.

In most embodiments of the present invention there is provided an insert which is intermediary between the rails and upright elements. In most cases, an interlocking connection is formed between the combination of insert, rail and upright elements so that the upright element is not readily withdrawable in at least one of its longitudinal directions.

More specifically, in many embodiments there is an interaction between the insert and the rail, and the upright member and the insert. In some instances they may be more than one type of insert used between upright members and different rails, and the interaction may vary.

For instance, it is usually desirable to prevent upright elements from being readily removed or falling free. Accordingly there should be an observed locking relationship between an upright member and at least one rail – though in practice the locking relationship may be via an intermediate insert of a first type. However, this locking relationship need not be repeated for all rails, and thus cheaper or simpler inserts of an alternative type or construction may be used here. This will become clearer from the ensuing description herein.

In some embodiments an interlocking arrangement between the three main components may not be required. For instance, one embodiment may comprise top and bottom rails

which cap the ends of the upright elements i.e. each end of each upright element passes through an aperture in the two rails, but does not pass fully therethrough. Providing the rails are secured in position at the posts or anchor points, it will not be possible to remove the upright elements without first disconnecting one of the rails.

In other arrangements, the user's preference may be for upright elements which extend above or below the level of the rails i.e. may pass entirely through one or more of the rails. In such situations, there should be some retaining arrangement to prevent the upright elements from merely being slid from the rails. This is perhaps especially important where some degree of security is also to be provided by the fence.

While various retaining arrangements may be relied upon to restrict removal of upright elements in a completed fence (including for instance welding, adhesive bonding, and mechanical fastening arrangements), it is perhaps desirable, at least for ready assembly, to rely on the insert to form any interlocking relationship between the rail and upright element.

In preferred embodiments apertures are already provided in the rails at the appropriate spacings and faces thereof. These apertures, which may be punched, drilled or formed by any other number of means, would generally be appropriately sized and configured to accept an insert. Typically, the insert will be inserted into this aperture and will ideally lock or snap into place once inserted. Again, various connection arrangements are known and may be employed in various embodiments, though a press-fit insert arrangement is perhaps easiest to use, especially when being inserted in the field. In some instances, the inserts may be pre-inserted at the factory, in which case harder to fit inserts may be relied upon.

Some of the methods which may be relied upon for an effective interaction between insert and rail include:

- there is one or more retractable, compressible, or resiliently deformable arms or barbs which, once the insert is positioned, splay outwardly and resist withdrawal of the insert;
- a keyed relationship between insert and rail, and
- at least part of the insert being compressible and/or deformable and including a locating groove or recess for accommodating part of said rail.

Another arrangement is where an insert interlocks with and is retained by the rail through a clipping arrangement involving a separate retaining member interacting with either or both the insert and rail. It is possible that such a retaining member interacts with and retains a plurality of inserts, and/or their associated upright elements.

In preferred embodiments an insert will have an outer annular groove commensurate to the thickness of the face of the rail and will fit to the rail much in the same manner as a grommet. This will become clearer from the drawings accompanying this specification. Other arrangements may also be relied upon (see also drawings).

Typically, an insert will present a sleeve or collar to an upright element which is inserted within the insert. Typically, the size and configuration of the aperture of the sleeve/collar will be commensurate to the outer size and configuration of the upright element. In some instances, a tight fit may be presented. However, in preferred arrangements, there is an interlocking arrangement resulting from the interaction between the features on both the upright element and insert.

For instance, an annular groove may be provided about, or at certain points on, the inserted portion of the upright element. One or more protrusions may be provided on the insert which will enter into the provided annular groove once the upright element is inserted. Once clipped, it may be difficult if not impossible to remove the upright

element. The protrusions and/or element may be modified to facilitate insertion, but resist withdrawal. The arrangement could also be reversed with protrusions being provided on the upright element and the annular groove within the insert. A plurality of these features may also be provided between the upright element and insert combination.

Other connections/interlocking relationships may also be relied upon between insert and upright elements. For instance, possible methods of forming an interlocking relationship between an insert and upright element include:

- one or more retractable, compressible, or deformable arms or barbs provided on the upright member which, once the upright element is positioned, splay outwardly and resist withdrawal of the insert;
- a portion of the upright member including a locating groove or recess for accommodating a feature on said insert, and
- a portion of the insert including a locating groove or recess for accommodating a feature on said insert.
- a portion of said insert is deformable or compressible in order to allow the feature, and groove or recess, to engage during assembly.

In an alternative embodiment of the invention there is a keyed relationship between the insert and upright element. To engage this relationship requires the upright element to be inserted into the insert and then rotated. Again, modifications may be made to resist the reverse combination of movements for withdrawal, once the upright element has been locked into place. In some instances, this interaction need not be great – for instance for circular embodiments the insert may substantially freely rotate within the rail making it difficult to disengage such keyed embodiments if some resistance to reverse rotation of the upright elements with respect to the insert, (for withdrawal) is provided.

A locking portion may be provided to prevent reversal of the keyed assembly process. Such a locking portion may comprise a compressible, movable, or resiliently deformable

feature which allows the other of the insert or upright element to pass by, during insertion, until a complementary portion on the other is encountered and engaged.

In most embodiments, the inserts will be of a rigid material, though preferably with some resilience. In preferred embodiments the use of a plastics material is preferred. This can provide several potentially realisable advantages, including the ability to readily mould plastics in a manner not common to many other materials. Further, many plastics materials have the required degree of stiffness and resilience to hold an inserted element in a tight manner. Where slightly oversized components are provided, the chosen plastic material may be able to deform slightly to accommodate the difference in size, and thereby maintain a tight fit. Further, the non-conducting nature of most plastics materials can help protect against galvanic action between the various components of the fencing system.

Another important advantage in some embodiments is the ability of the plastics material to deform slightly or exhibit resilience. Because of this, it is possible in many embodiments to angle the upright elements slightly with respect to the rails. Here the resilience and deformability of the inserts (depending upon the design) may allow the upright element to be inserted and held other than at the true perpendicular to the rail. The actual deviation from perpendicular will vary according to the nature of the insert, and whether the upright element passes entirely through the rail (and consequently the positioning of apertures to accommodate the upright element on opposite faces of the rail). While modifications may be made to accommodate a wide range of angles of deviation, it is envisaged that most embodiments will allow the upright element to be positioned within ± 30° inclusive of the perpendicular, while the bulk of embodiments will allow a deviation of ± 15° of the true perpendicular. In embodiments where the rails are always to be truly horizontal to the ground, the deviation may be limited to within a few degrees of the true perpendicular e.g. ± 5°.

In embodiments where a large angle deviation from the perpendicular is required, modified inserts may be provided in which the provided sleeve aperture for the upright element is at an angle to the perpendicular when the insert is at rest within the rail i.e. not under any stress or deformation. A range of different inserts may therefore be provided so that the user, on site, can select the most preferable insert for the situation.

BRIEF DESCRIPTION OF DRAWINGS

Further aspects of the present invention will become apparent from the ensuing description which is given by way of example only and with reference to the drawings accompanying the provisional specification and in which:

Figures 1 illustrate one preferred embodiment of an insert, its relationship with the rail, and an embodiment of an upright element for use with same; and

Figure 2 is an alternative embodiment of the central portion of an insert and an upright element for use with same, illustrating the interlocking portions; and

Figures 3 represent a further embodiment of an interlocking insert and its relationship in a capping embodiment of a rail; and

Figures 4 illustrate a rectangular embodiment of an insert, its relationship with the rail and an embodiment of an upright element for use with same; and

Figures 5 illustrate a further preferred embodiment of the present invention; and

Figures 6 illustrate modified washer and insert used in the embodiment of Figure 5.

BEST MODES FOR CARRYING OUT THE INVENTION

With reference to the drawings by way of example only, there is provided a fence (not shown) comprising a plurality of upright elements (1-3) spanning at least two rails (4-6), the arrangement being such that the upright elements (1-3) are positioned within apertures (7, 8) in said rails (4-6), there being inserts (9-12) between said rail (4-6) and upright element (1-3) to maintain the relative disposition of same.

Figures 1 illustrate one particular arrangement according to the present invention. Figure 1a shows a plan view of a preferred insert of this particular embodiment. This insert 9 resembles a grommet and includes an annular groove 13 to which the edge of the aperture 7 provided in the rail 4 is accommodated. This effectively locks the insert 9 into place with respect to the rail 4. This can be seen in Figure 1b where a capping type rail (4) is used, while in Figure 1c the rail 4a has been modified to allow the upright elements to pass entirely through the rail 4a.

Once the insert 9 is positioned within the rail 4, 4a, it is difficult to remove. Some rotation of the insert 9 is possible, with respect to the rail, which can resist removal of the upright element 1 when locked into position.

Figure 1c illustrates an upright element 1, and also the pin 14 extending from opposite sides of the insert 1. This pin (when the upright element 1 is being inserted into the insert 9) travels down provided channels 15 until they encounter the annular groove 16 provided on the inside of the insert. At this point, the upright element 1 is rotated so that the pin travels through the annular groove 16 (whose diameter gradually decreases so that the pin represents a tight fit) and then encounters a further recess 17. At this point, the pin 14 clicks into position so that the insert 1 cannot be rotated in the opposite direction for removal. If the upright element 1 is rotated, then the insert 9 will rotate with it.

Figure 2 illustrates the central portion 10 of an insert. Various locking arrangements, such as illustrated in Figures 1, can be used to secure the insert 10 in position with respect to the rail.

Provided on the inside of the insert 10 is an inwardly directed circumferential barb which interacts with an annular groove 18 on upright element 2. As can be seen, there is a one way interlocking interrelationship between the barb 19 and groove 18.

Figures 3 illustrate a further embodiment of an insert 11. This insert 11 connects to the rail 5 in the same manner of insert 9. Two inwardly directed protrusions 20 are provided which interact with recesses in an upright element. The recess may comprise an annular groove such as illustrated in Figure 2b, or may merely comprise appropriately dimensioned and positioned apertures in the upright element.

In the arrangement of Figure 3a, the rail 5 acts as a capping rail i.e. the upright element 11 does not pass entirely through the rail 5. Such a capping rail 5 may be provided on the top and/or bottom of a section of the constructed fence.

Figures 4 illustrate an alternative insert 12 which is of substantially rectangular cross section when viewed in plan. The length (when viewed left to right in the diagram) is commensurate to the inside width of the rail. This enables the insert 12 to be inserted through an aperture 25 in the base of the rail 6 then rotated 90' so that its length is directed width ways within the rail.

This inserted position is illustrated in Figures 4b and 4c. Because of the rectangular nature of the insert 12, it is not easily locked in or out of position. When the insert 3 is inserted, an annular groove 26 accommodates protrusions 27 on the insert. Lengthwise removal of the inserted upright element 3 is not easy due to the nature of the interlocking relationship (26, 27). Because the protrusions 27 are accommodated by an annular groove 26 extending the entire circumference of the upright element, the upright element 3 is able to be continuously and freely rotated once inserted. Accordingly, it is not

possible to use the inserted element 3 to attempt to rotate and remove the insert 12 from the rail 6. This helps ensure good resistance to upright element 3 removal, which is desirable in security conscious applications.

The accompanying drawings illustrate but a few possible arrangements of an upright element, and insert and rail. The illustrated examples are demonstrative only and represent but a few possible embodiments of the present invention. Other fastening and clipping arrangements between inserted rail and insert and rail are possible, and may be employed in various embodiments.

Various embodiments may also be more or less adapted to arrangements in which the inserted element is not truly perpendicular to the rail. For the arrangement of Figure 4c, the elongated aperture 25 allows the upright element 3 to be angled with respect to the rail 6 – the bottom aperture 25 is not so restrictive as to prevent any angling of the upright element 3 with respect to the true perpendicular. In the embodiment of Figure 1b, deformation of the insert 9 will allow some angling of the insert with respect to the rail 4, though an even lesser degree of angling would be possible in the arrangement of Figure 1c unless the width of the bottom aperture (measured left to right on the drawing of Figure 1c) was enlarged into a slot.

The arrangement of Figure 4c is perhaps best for embodiments in which the upright element must be angled with respect to the rail. In this arrangement, it is possible for the entire body of the insert 12 to angle to match the orientation of the upright element 3. However, in the embodiments of Figures 1 and 3, excessive angling may cause release of the insert from the rail. This may be partially addressed by providing modified angled inserts in which the inserted element is naturally held at a particular angle.

In some instances, it may be difficult to physically insert the upright elements 3 through the plastic inserts 52, 53 associated with the rails 50, 51. Problems are particularly encountered for the lower rail 51 mounting where the barb 54 may be difficult to pass

through the round aperture 55 of the insert 53. In the embodiment of Figure 6a a cut 56 is provided down one side of the insert 53. This allows the central aperture 55 to expand as the upright element 3 is passed through, allowing barb 54 to click into place within the insert (see for instance Figure 5c). However, providing the cut 56 can compromise the effectiveness of the insert 53 in preventing removal of the upright element 3. In some cases attempted rotation and pulling on the element 3 could result in withdrawal of the upright element 3 from the insert 53.

To address this, the embodiment of Figures 5 makes use of a rigid insert 60, typically of metal, which interacts with the base of the flexible insert 53. The upright element 3 may be further modified immediately below the barb 54 by the provision of a groove, or flattened portion of lesser diameter, which corresponds to the internal width across the aperture 61 of insert 60. In Figures 6b, this is the narrowest dimension of the aperture 61.

The consequence is that once pushed into position, the upright element is unable to rotate with respect to rigid insert 60. Upward tabs 62 on the insert 60 interact with further apertures 58 on the flexible insert 53. As a consequence, in an installed embodiment (see Figure 5c for instance) it is not possible to rotate the upright element 3 with respect to flexible insert 53, or rigid insert 60. Any attempted rotation of the upright element 3 will result in corresponding rotation of inserts 53 and 60, which would normally only occur during initial installation of an upright element 3 in the bottom rail 51.

Similar principles may also be applied to a mounting system associated with the top rail of 50. Various other modifications and adaptations of the principles generally shown in Figures 5 and 6, may also be applied in other embodiments of the present invention.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.